OIPE JC10 DEC 05 2003 PATENT & TRADEMARK OFFICE

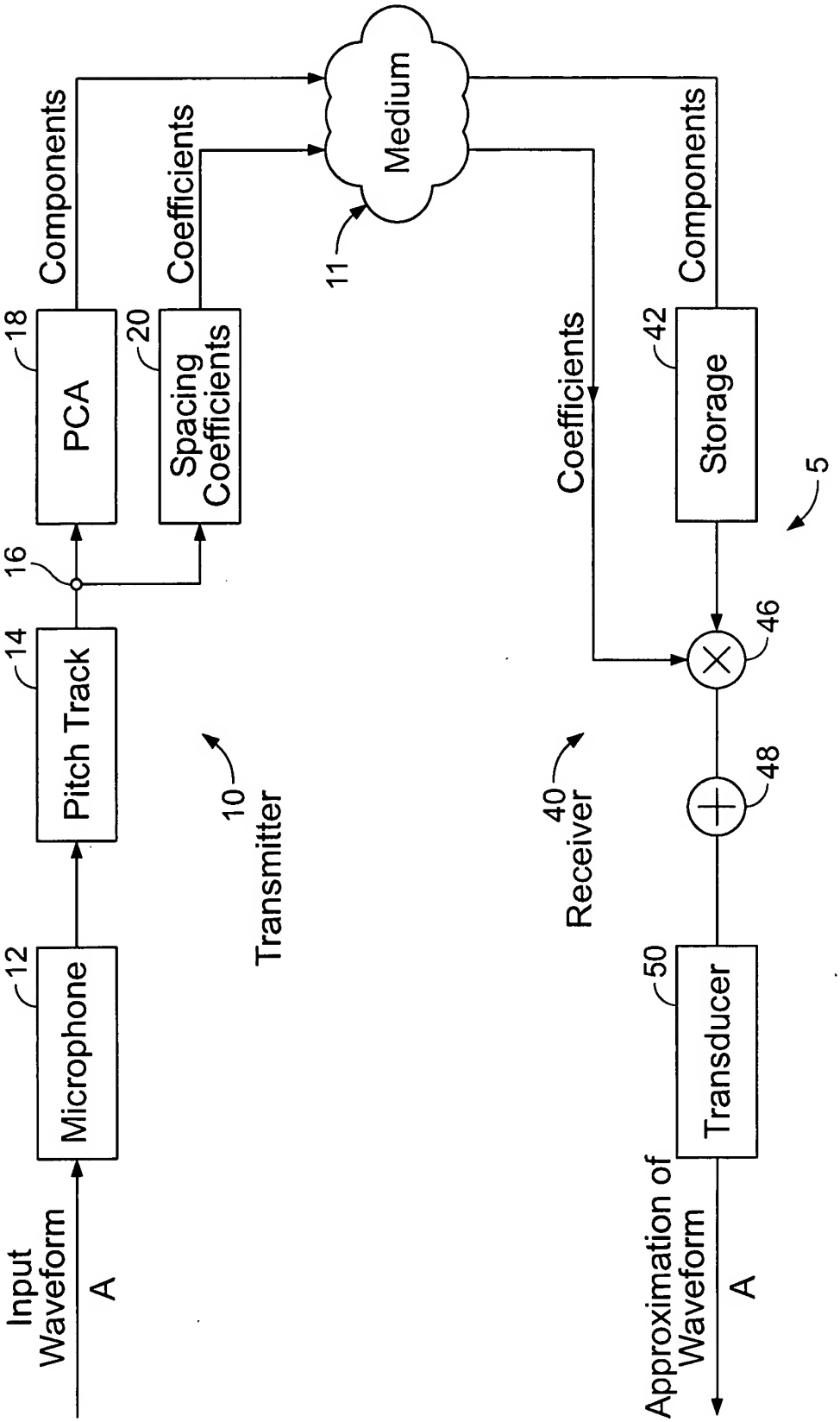

FIG. 1

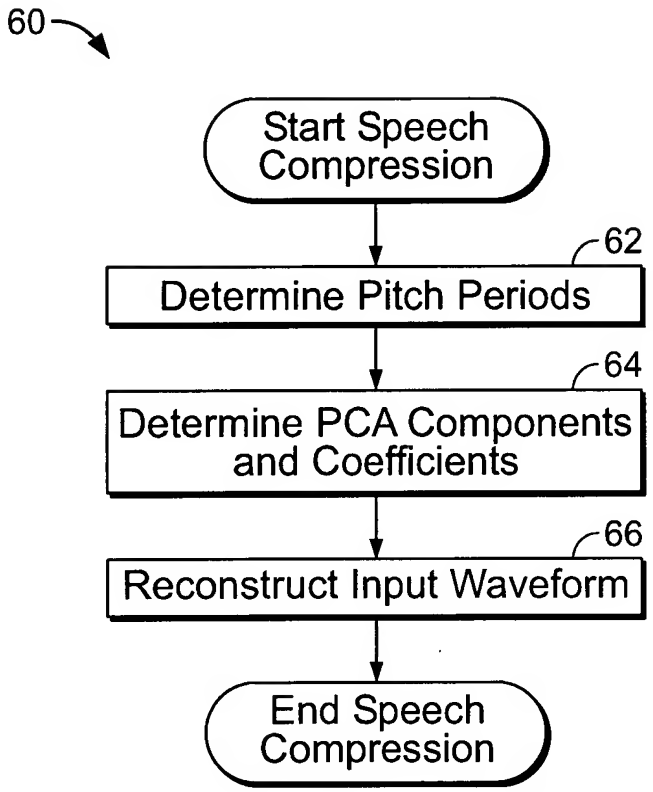
60
Start Speech Compression
62
Determine Pitch Periods
64
Determine PCA Components and Coefficients
66
Reconstruct Input Waveform
End Speech Compression

FIG. 2

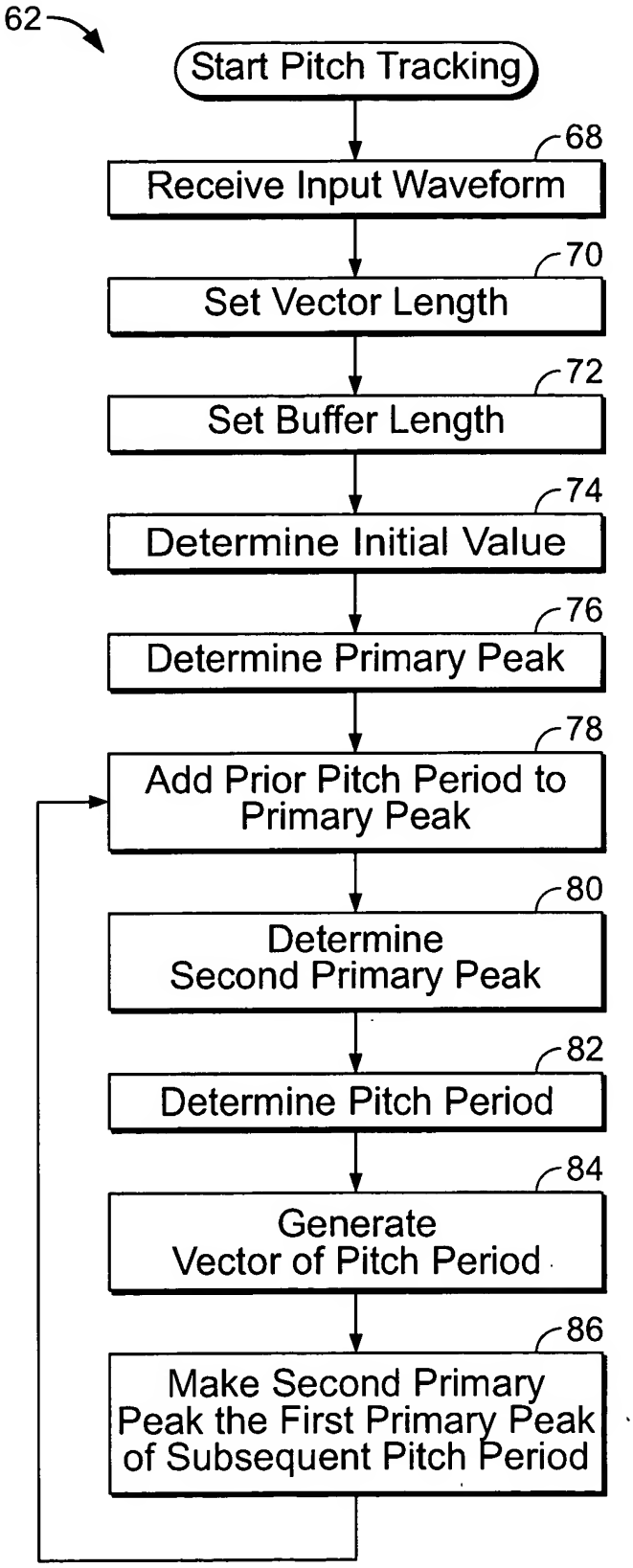
62
Start Pitch Tracking
68
Receive Input Waveform
70
Set Vector Length
72
Set Buffer Length
74
Determine Initial Value
76
Determine Primary Peak
78
Add Prior Pitch Period to Primary Peak
80
Determine Second Primary Peak
82
Determine Pitch Period
84
Generate Vector of Pitch Period
86
Make Second Primary Peak the First Primary Peak of Subsequent Pitch Period

FIG. 3

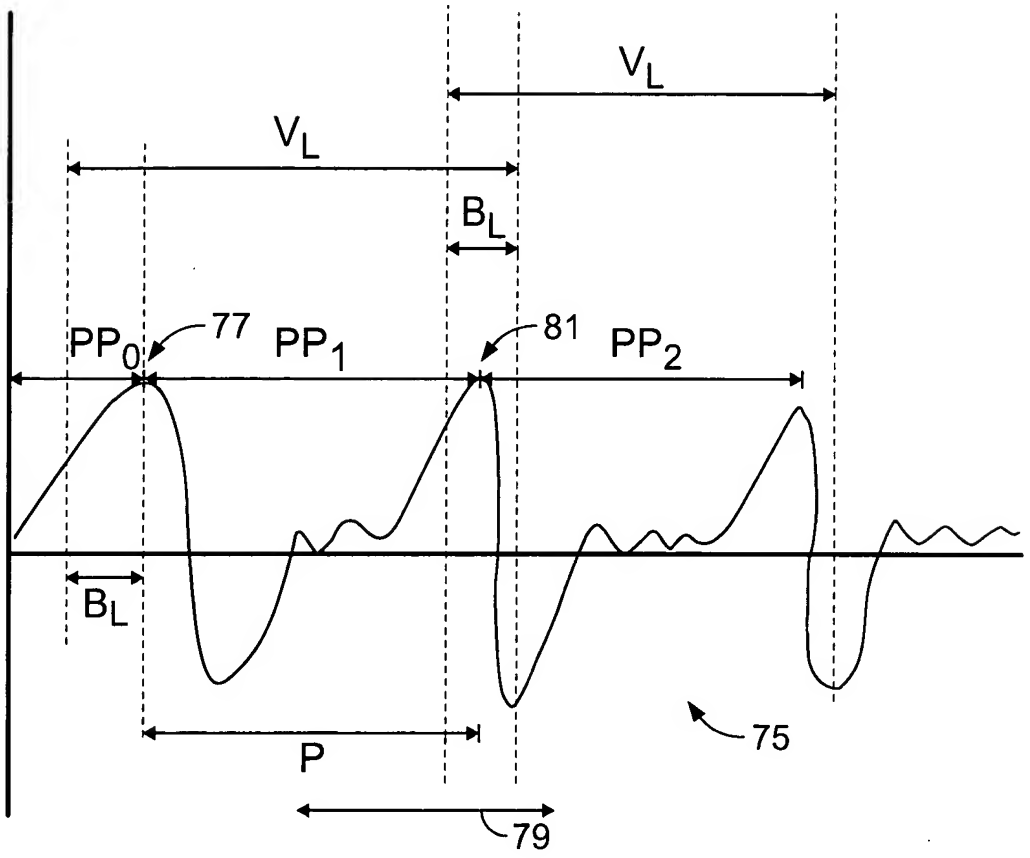

FIG. 4

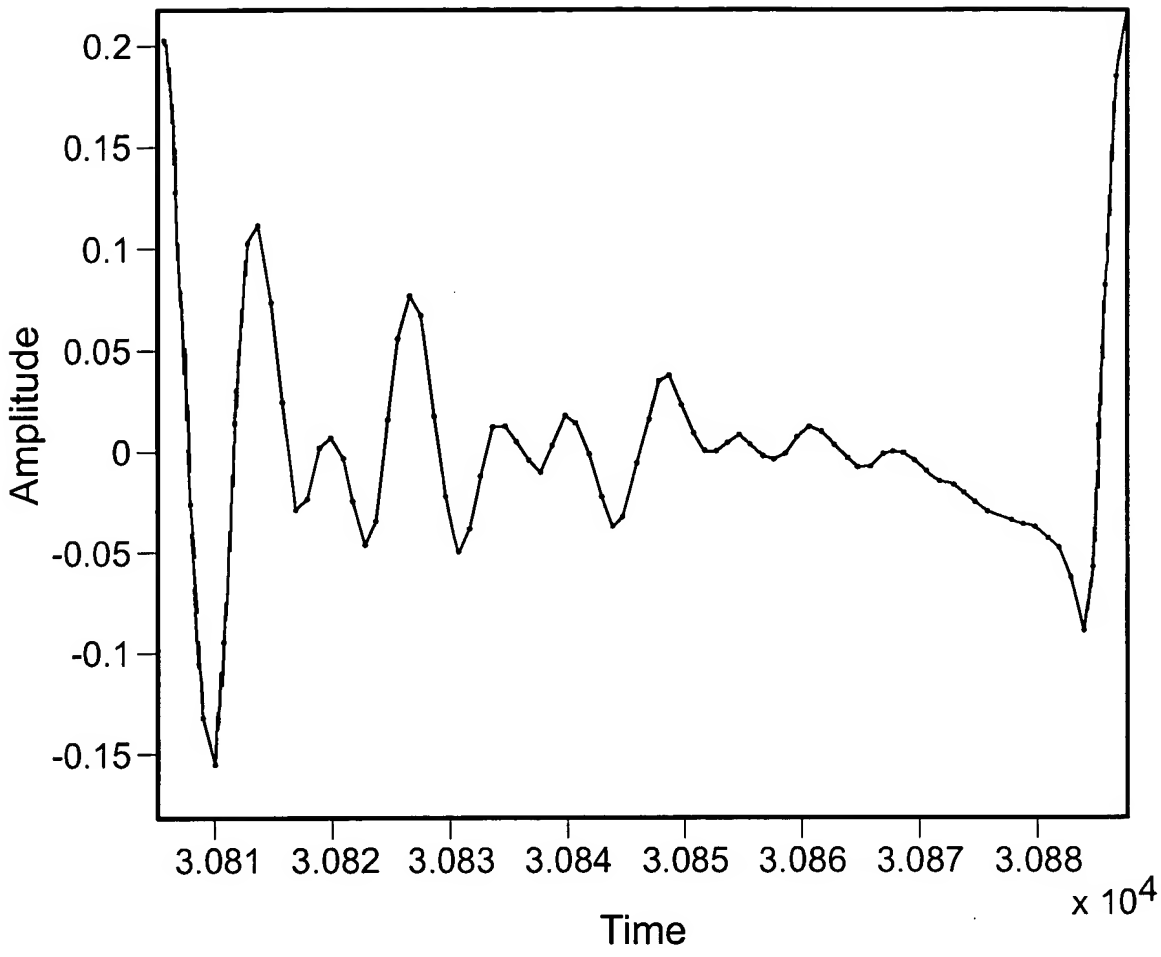
0.2
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
Amplitude
3.081
3.082
3.083
3.084
3.085
3.086
3.087
3.088
x 10^4
Time

FIG. 5

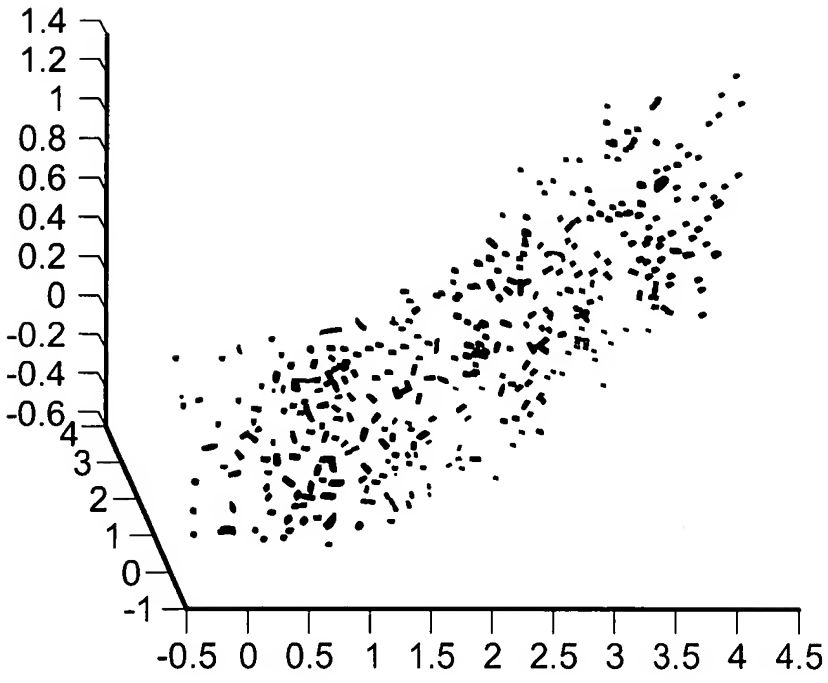

FIG. 6A

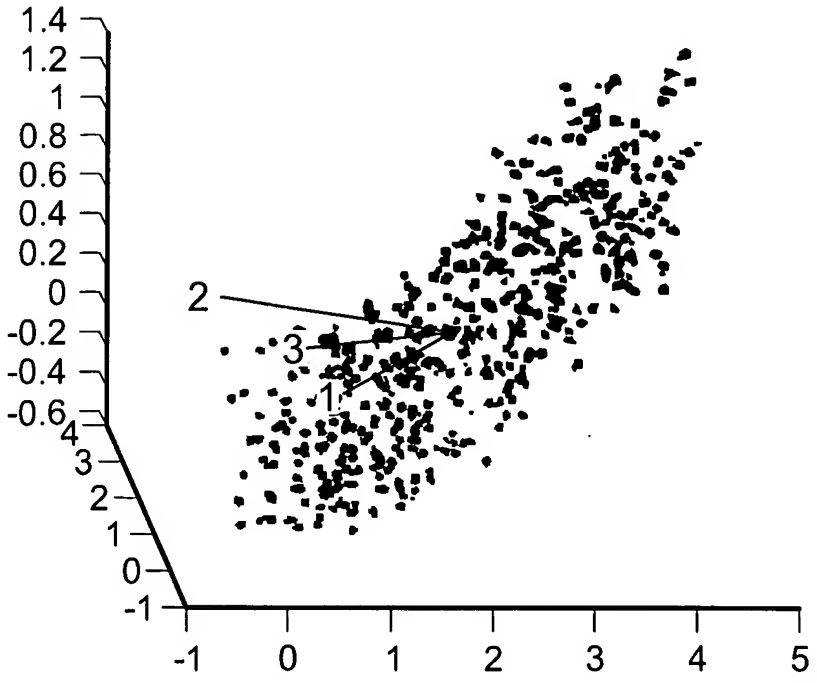
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
4
3
2
1
0
-1
-1
0
1
2
3
4
5
2
3
1

FIG. 6B

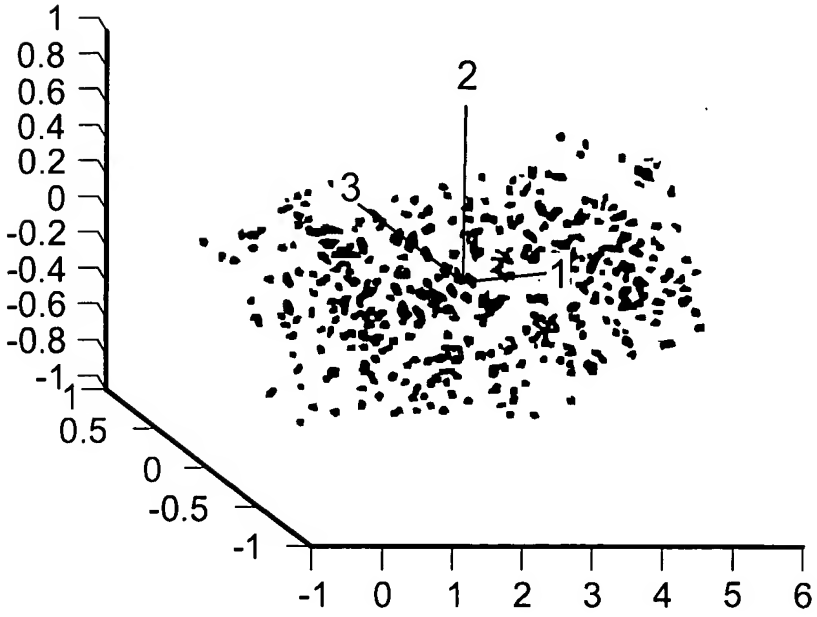
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
1
0.5
0
-0.5
-1
-1
0
1
2
3
4
5
6
2
3
1

FIG. 6C

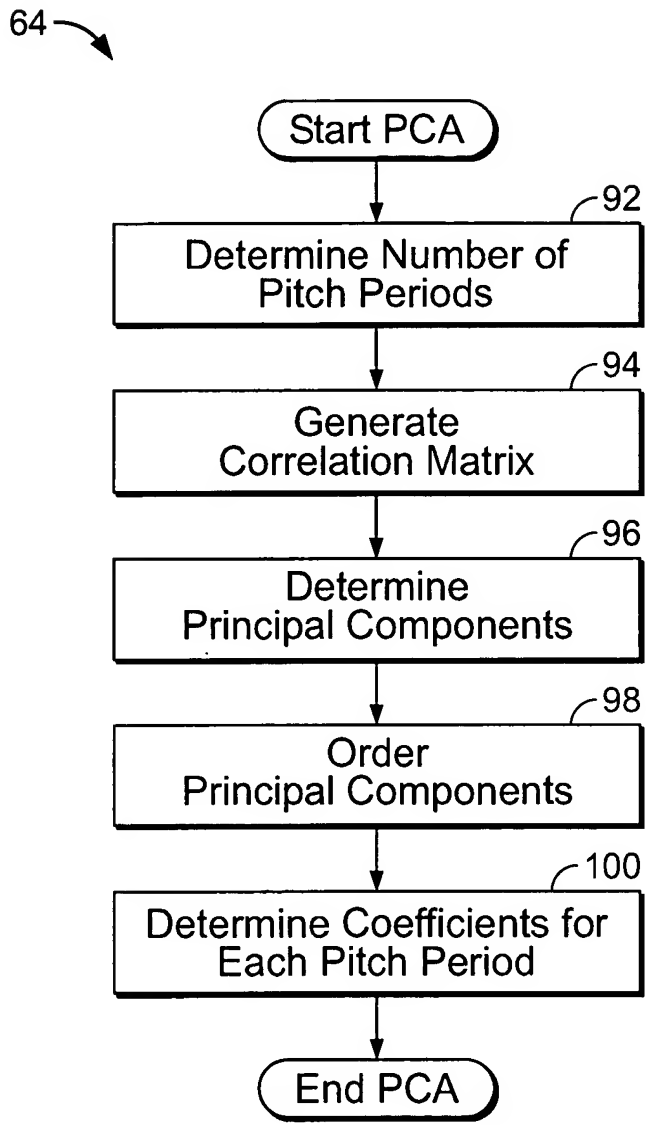
64
Start PCA
92
Determine Number of Pitch Periods
94
Generate Correlation Matrix
96
Determine Principal Components
98
Order Principal Components
100
Determine Coefficients for Each Pitch Period
End PCA

FIG. 7

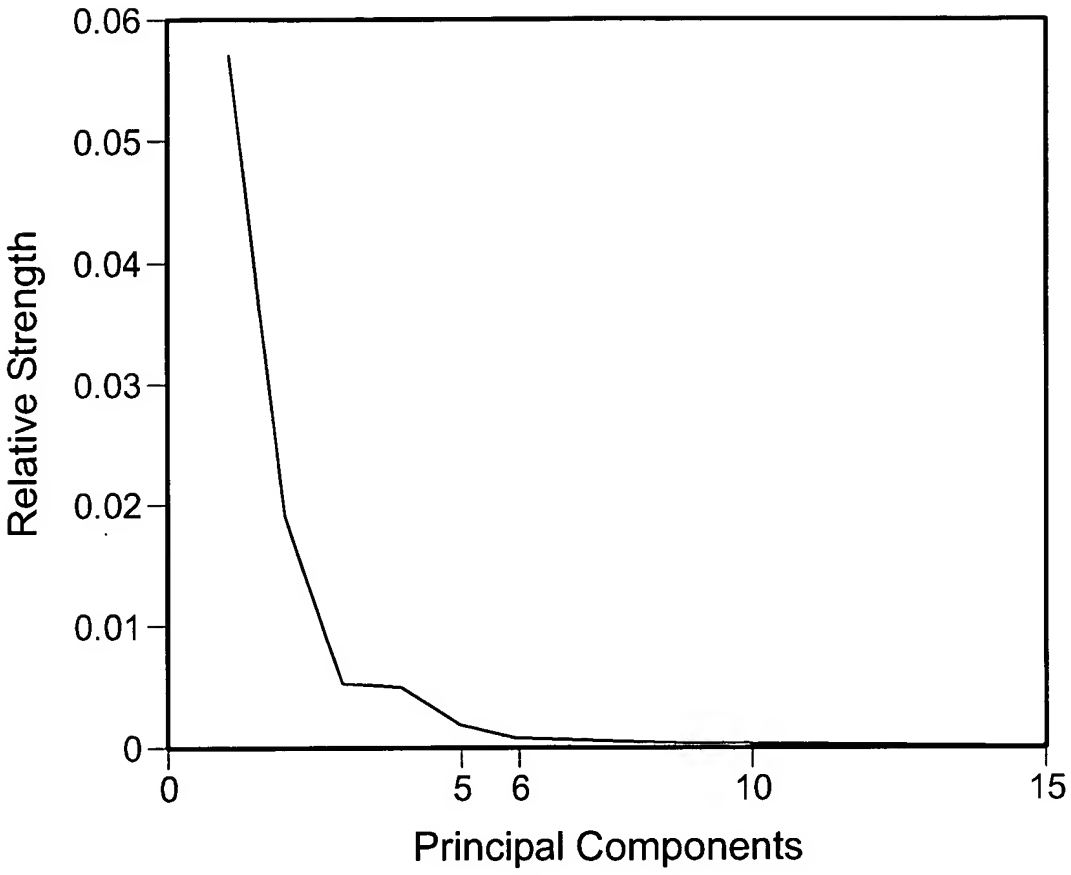
0.06
0.05
0.04
0.03
0.02
0.01
0
Relative Strength
0
5
6
10
15
Principal Components

FIG. 8

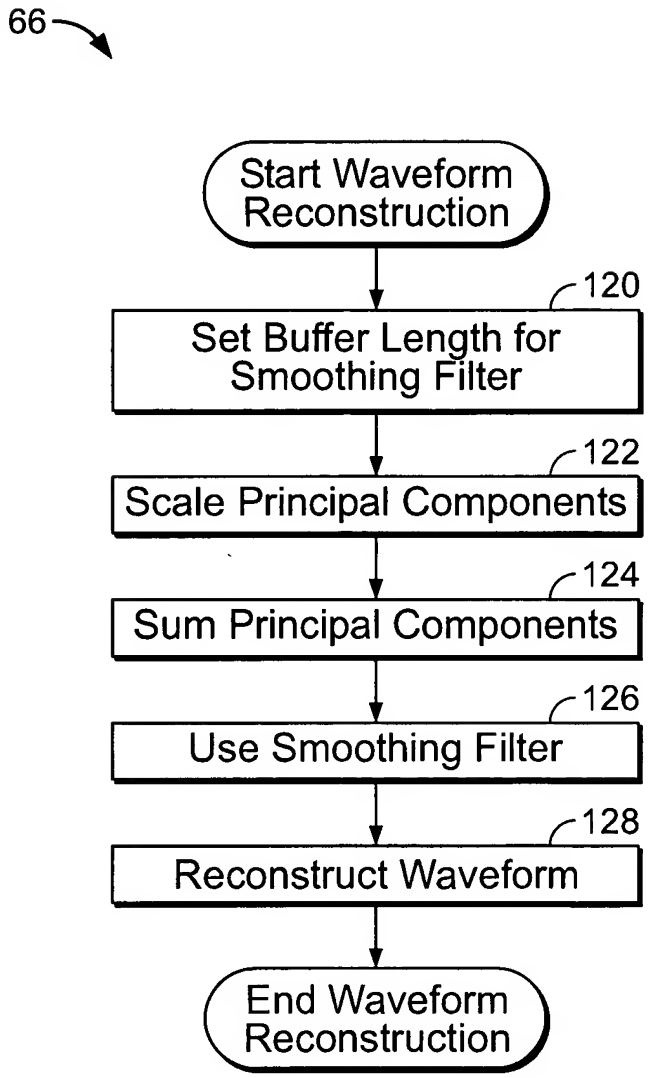
66
Start Waveform Reconstruction
120
Set Buffer Length for Smoothing Filter
122
Scale Principal Components
124
Sum Principal Components
126
Use Smoothing Filter
128
Reconstruct Waveform
End Waveform Reconstruction

FIG. 9

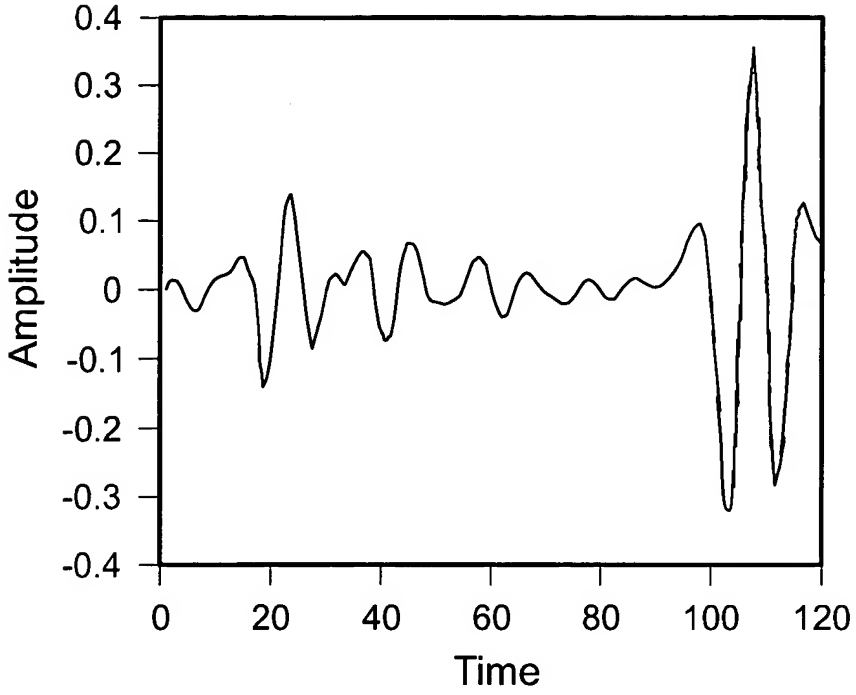

FIG. 10A

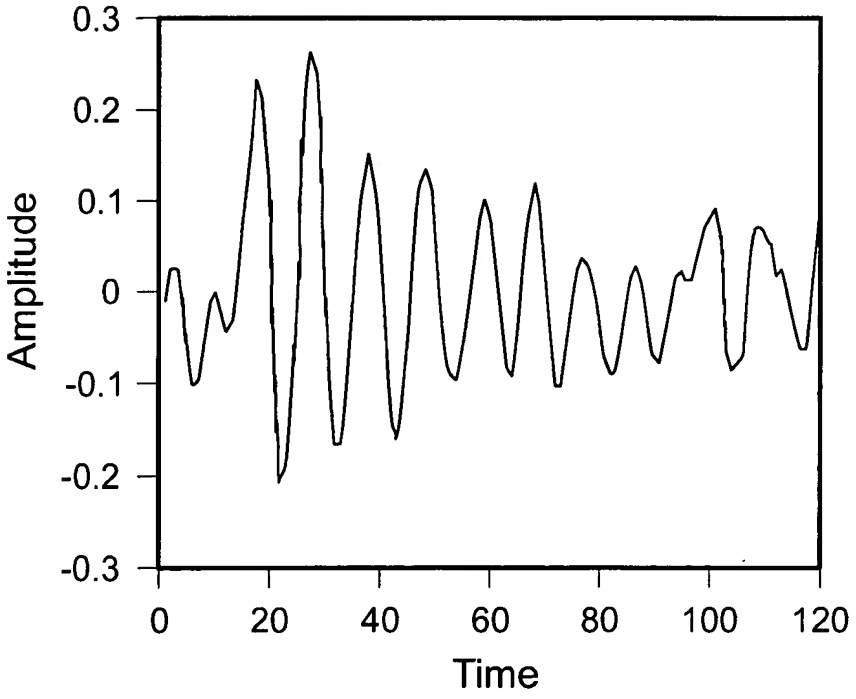

FIG. 10B

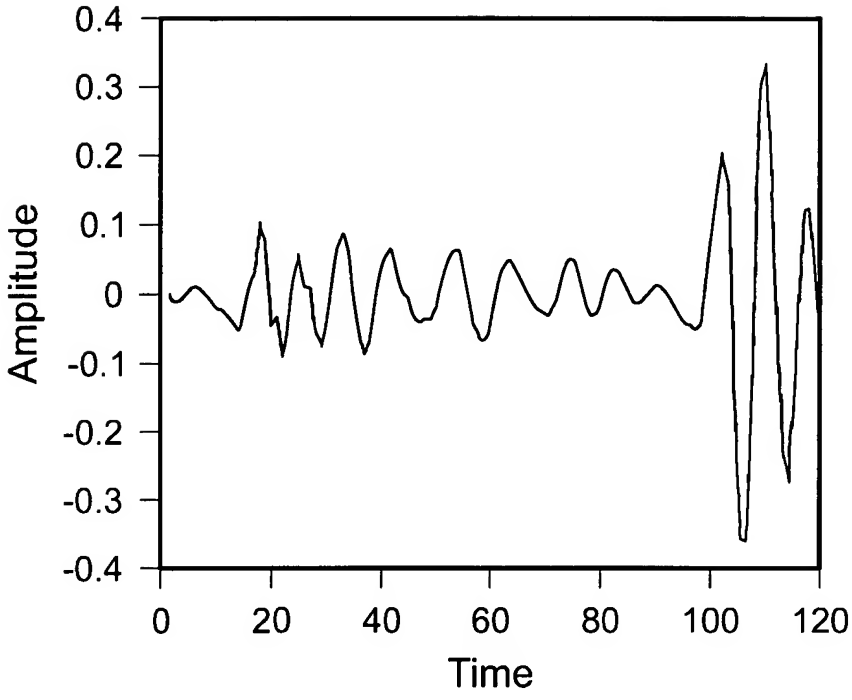

FIG. 10C

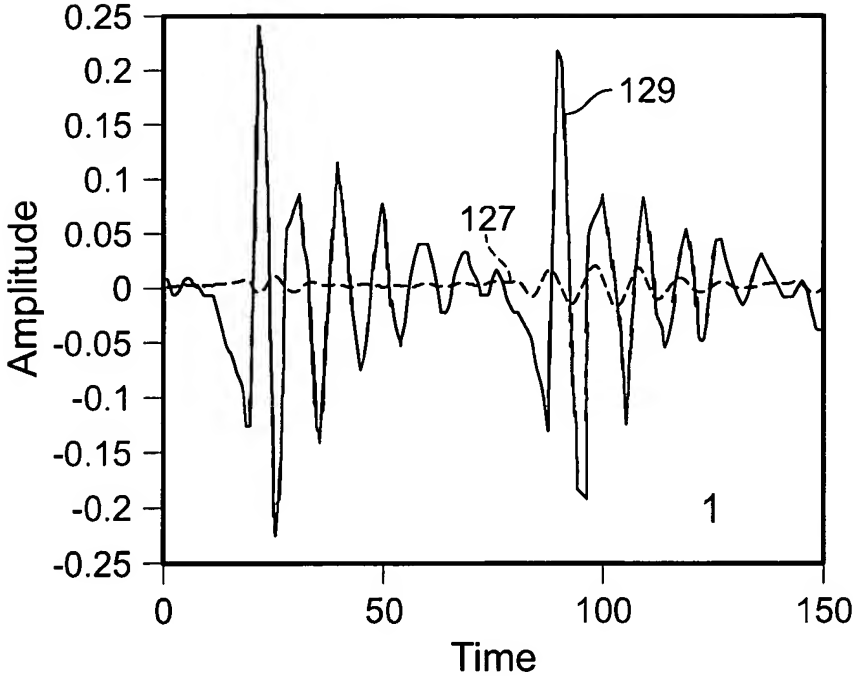

FIG. 11A

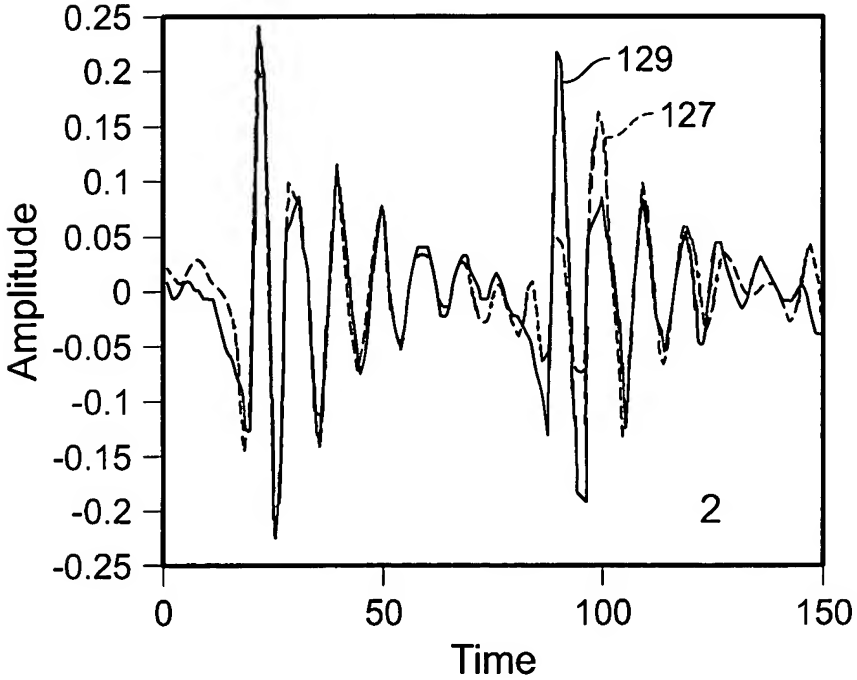

FIG. 11B

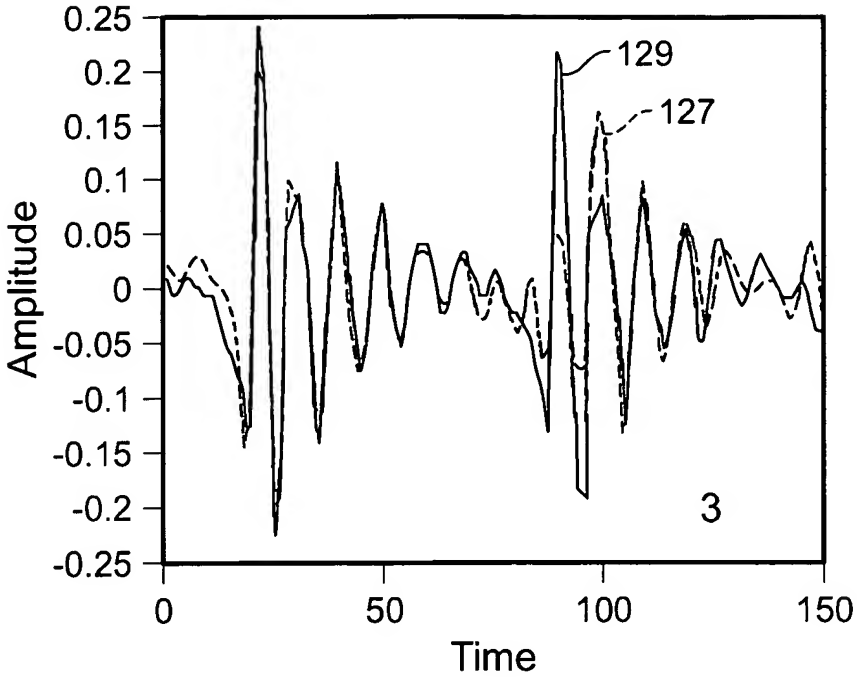

FIG. 11C

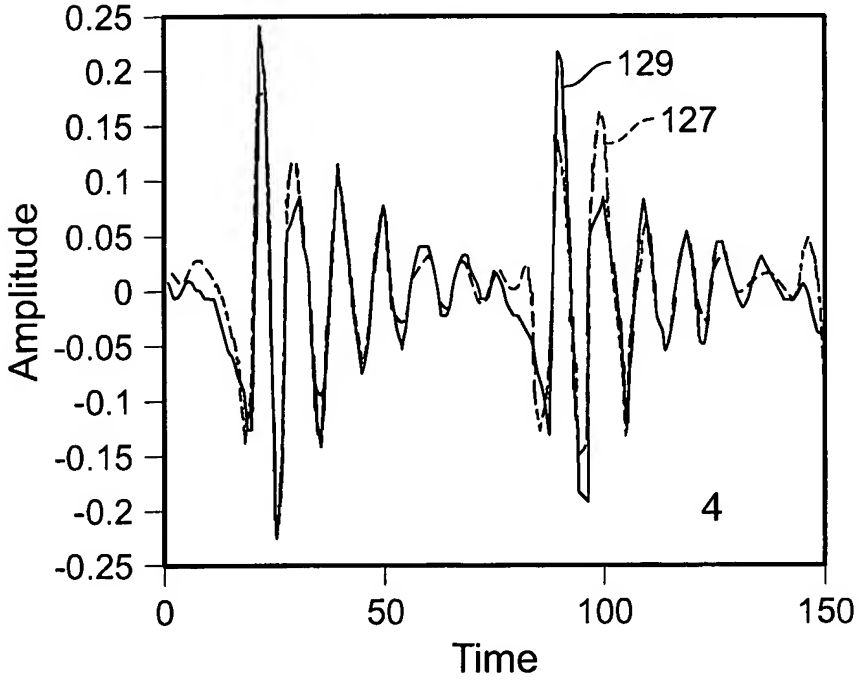

FIG. 11D

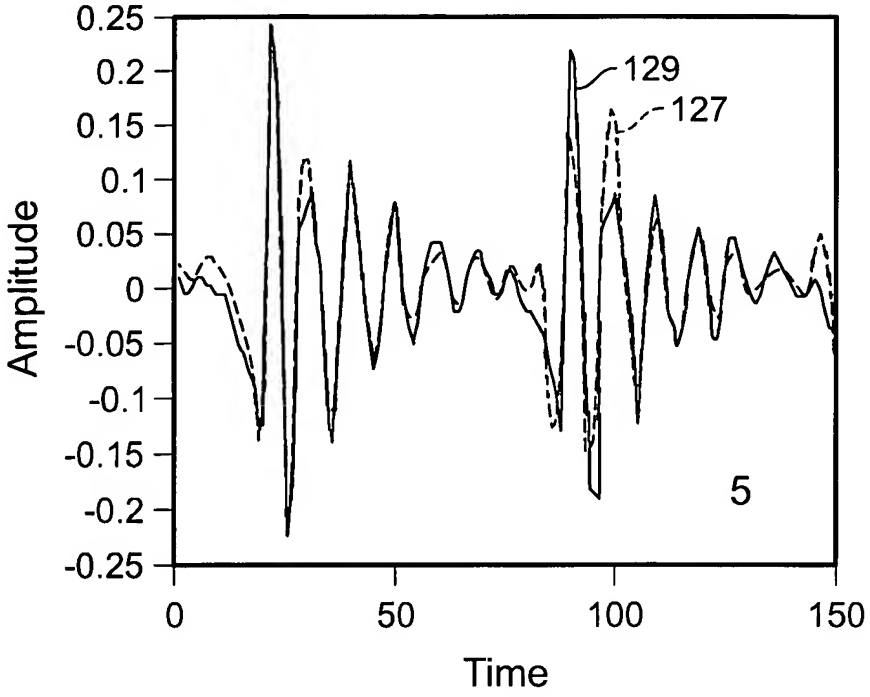

FIG. 11E

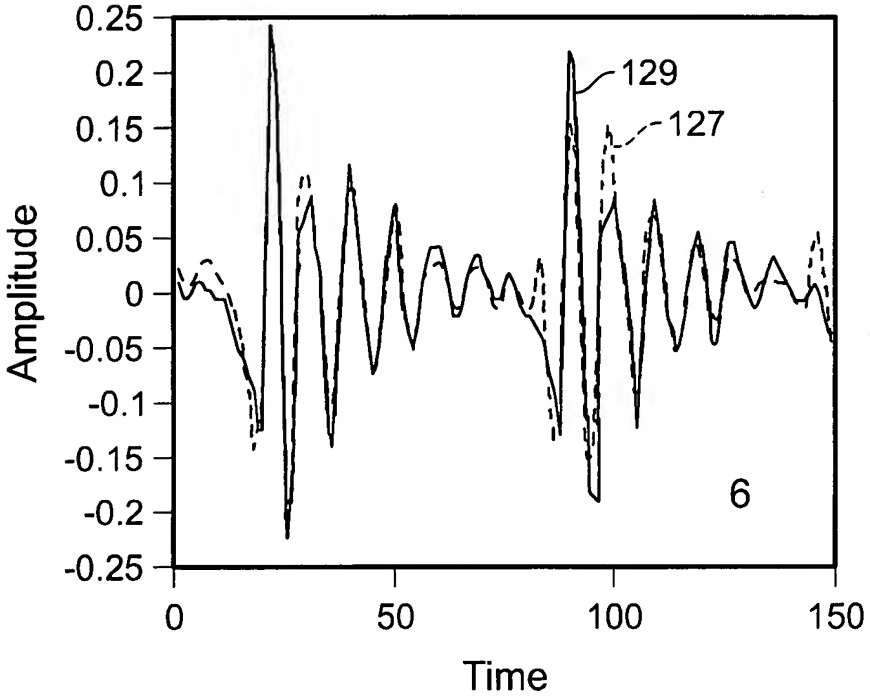

FIG. 11F

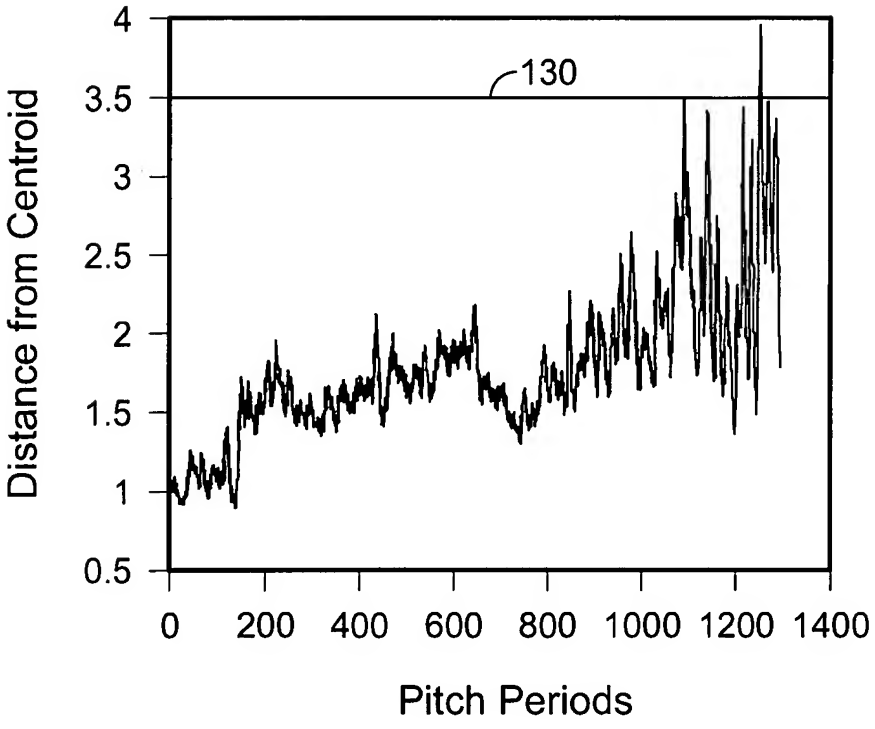
Distance from Centroid
4
3.5
3
2.5
2
1.5
1
0.5
130
0
200
400
600
800
1000
1200
1400
Pitch Periods

FIG. 12

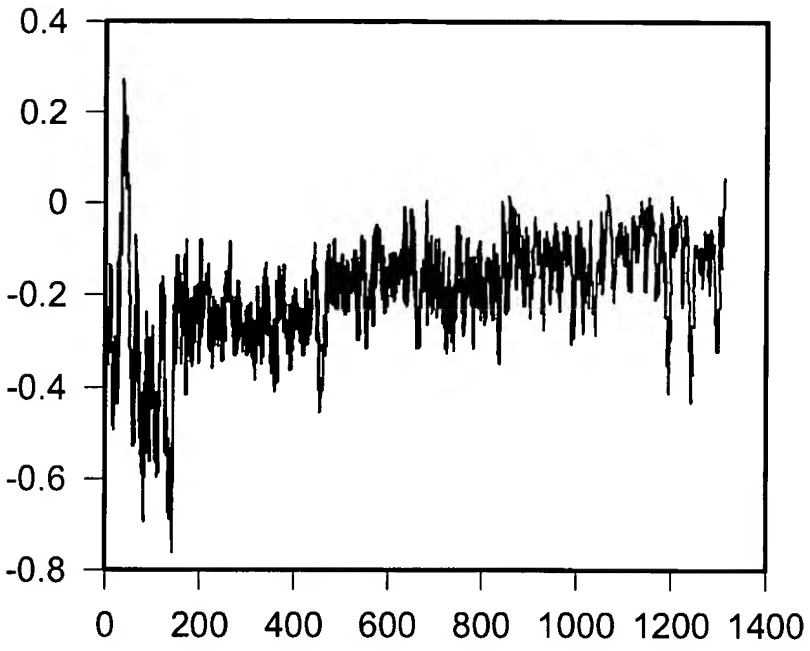

FIG. 13A

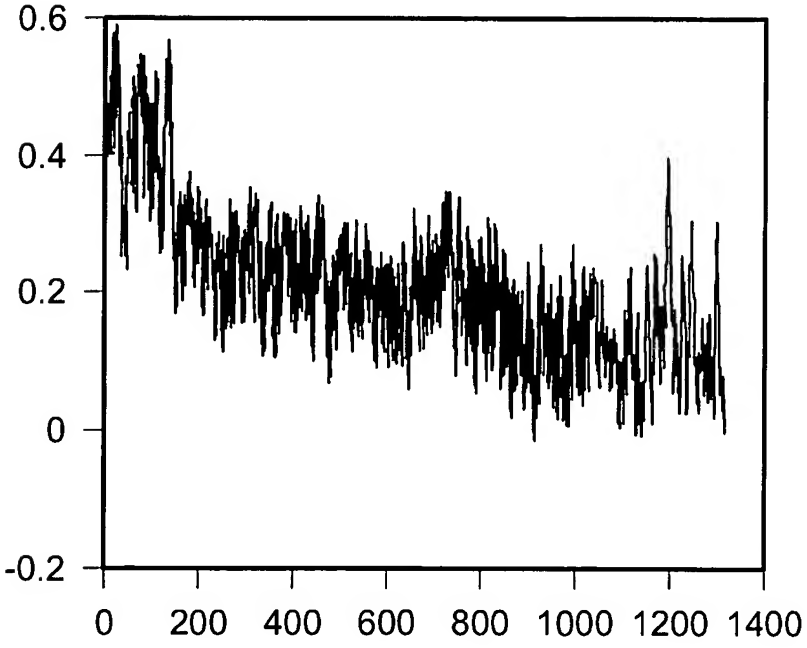

FIG. 13B

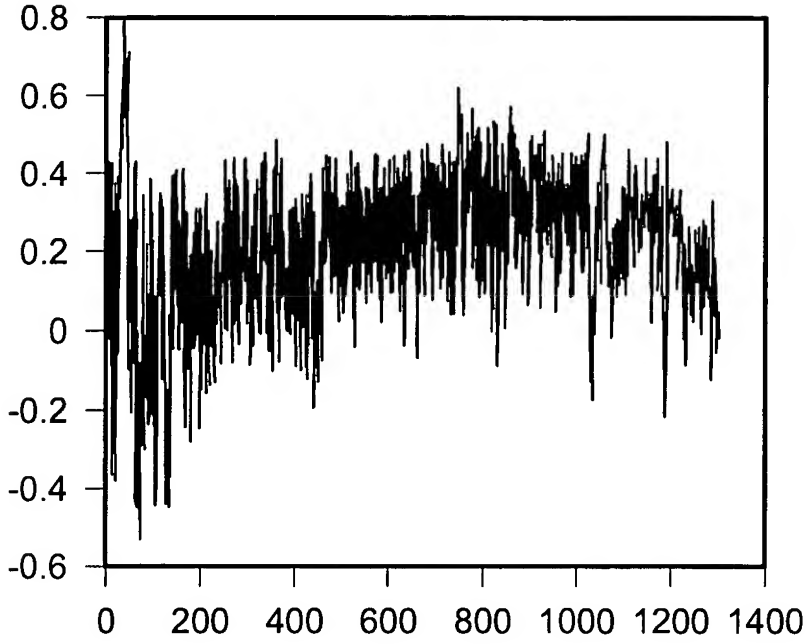

FIG. 13C

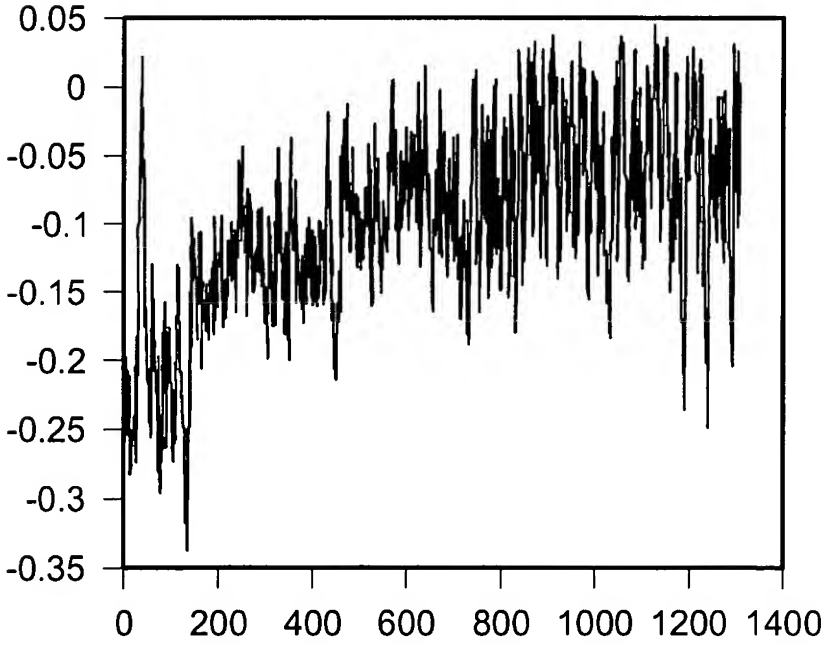

FIG. 13D

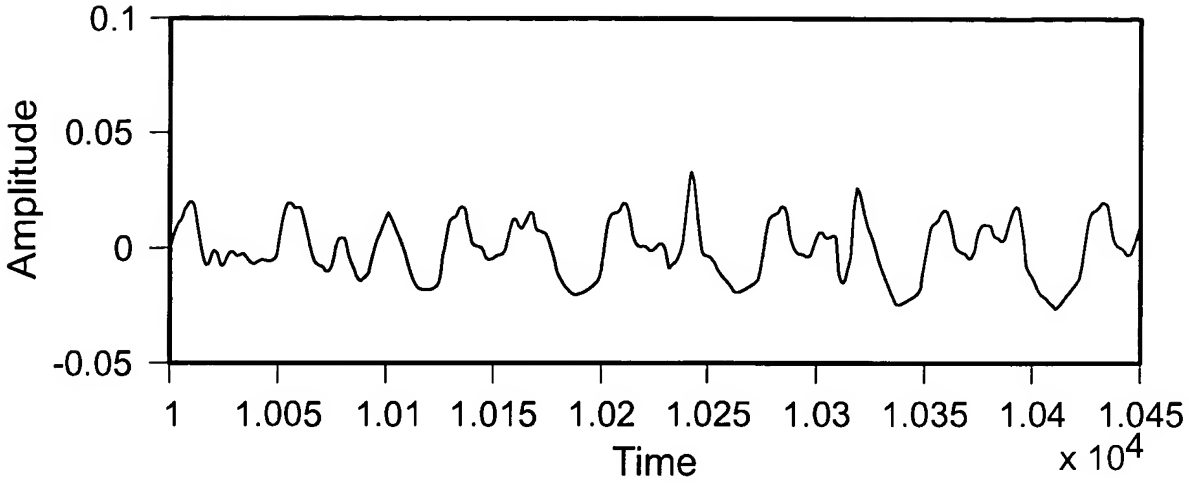

FIG. 14A

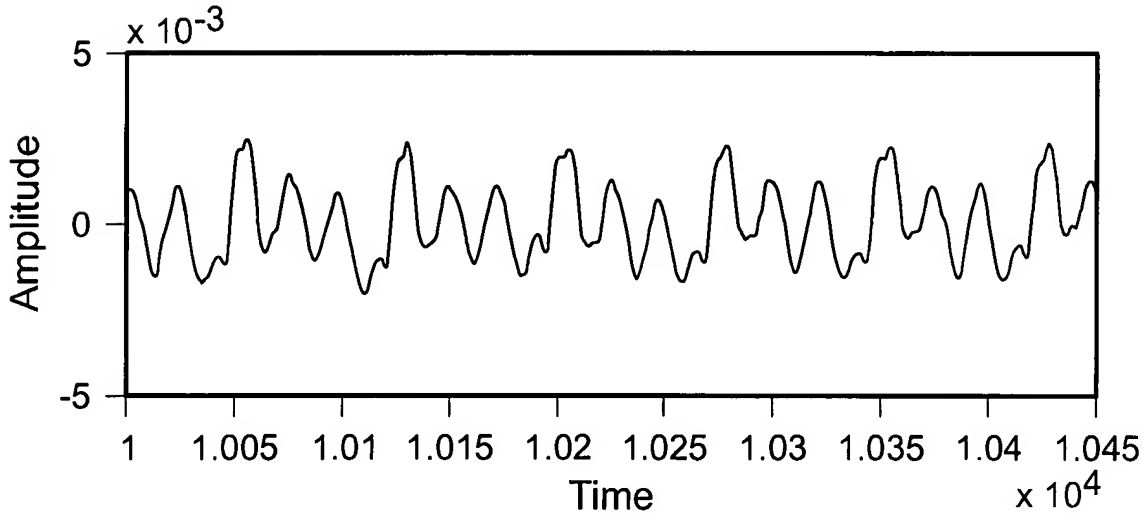

FIG. 14B

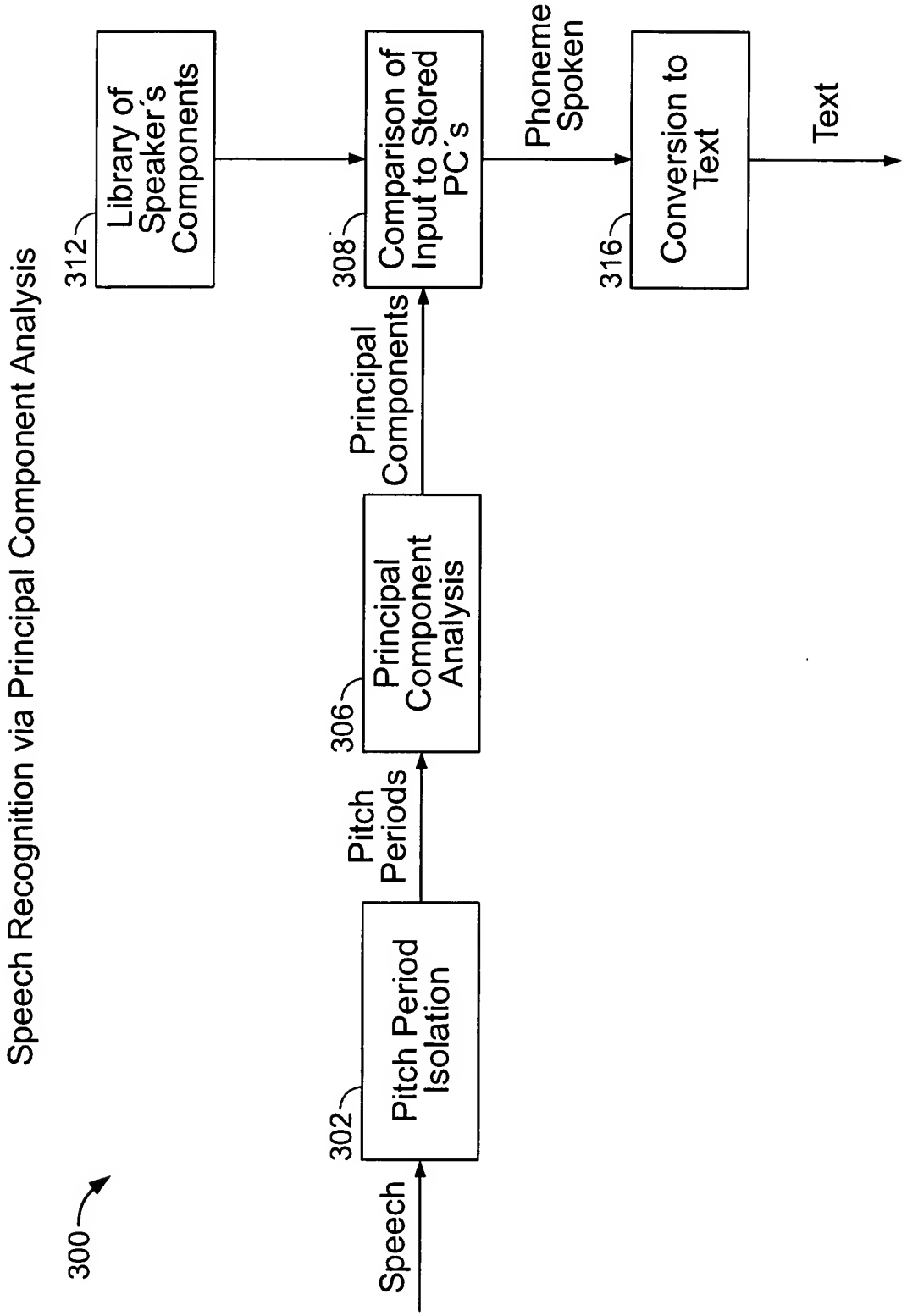
Speech Recognition via Principal Component Analysis
300
Speech
302
Pitch Period Isolation
Pitch Periods
306
Principal Component Analysis
Principal Components
308
Comparison of Input to Stored PC's
312
Library of Speaker's Components
Phoneme Spoken
316
Conversion to Text
Text

FIG. 15

Speech Synthesis via Principal Component Analysis

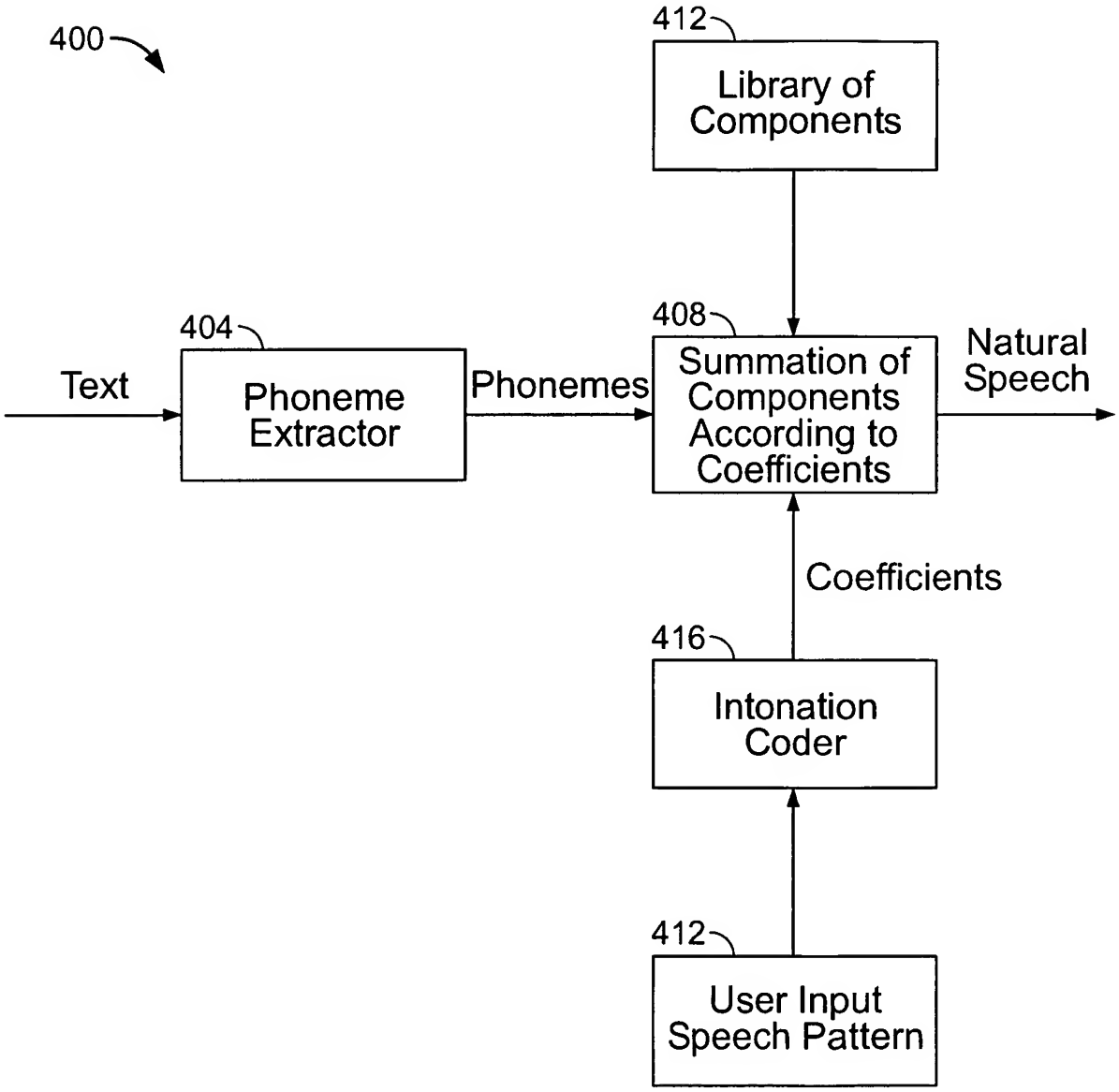

FIG. 16

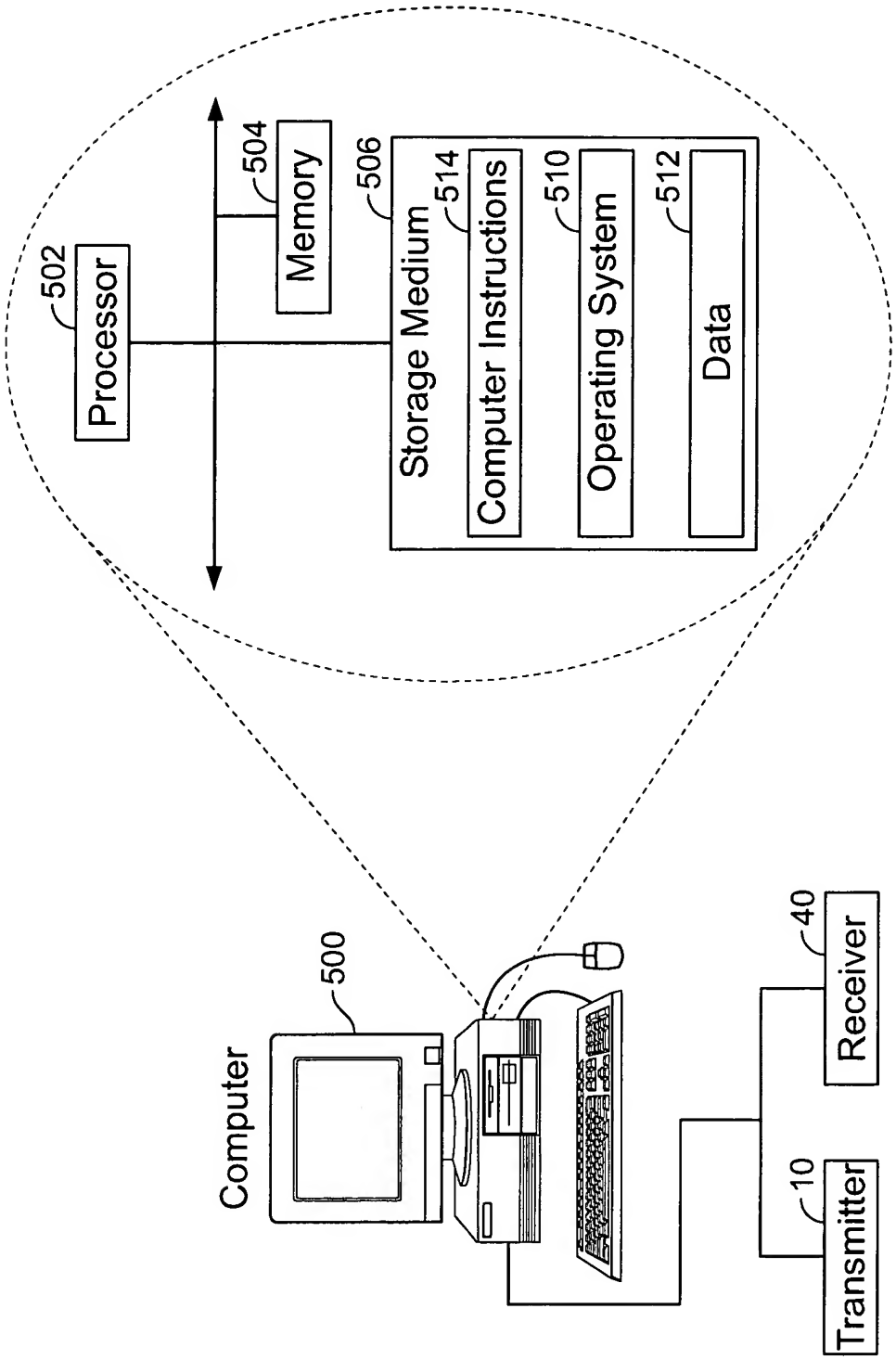
Computer
500
Processor
502
Memory
504
Storage Medium
506
Computer Instructions
514
Operating System
510
Data
512
Receiver
40
Transmitter
10

FIG. 17